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Dysphagia in the intensive care unit in Switzerland (DICE) – results of a national survey on the current standard of care

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Summary

INTRODUCTION: Oropharyngeal dysphagia (OD) is often observed in critically ill patients. In most affected patients OD persists throughout hospital stay and negatively impacts on clinical outcomes. Here we systematically explore routine clinical practice standards for recognition/screening, diagnosis and treatment of OD in accredited Swiss ICUs.

METHODS: An online, 23-item questionnaire-based survey was performed to investigate current standards of care for OD in Switzerland (DICE). All (n = 49) accredited Swiss teaching hospitals providing specialist training for adult intensive care medicine were contacted. Senior intensivists were interviewed on how they would screen for, diagnose and treat OD in the ICU.

RESULTS: The total response rate was 75.5%, with information available on all tertiary care academic centres. 67.6% (25/37) of institutions stated that they have established standard operating procedures for OD using a mostly sequential diagnostic approach (86.5%, 32/37). In 75.7% (28/37) of institutions, OD confirmation is performed without the use of instrumental techniques such as flexible (or fibre-endoscopic) evaluation of swallowing (FEES). Presumed key risk factors for OD were admission for acute neurological illness, long-term mechanical ventilation, ICU-acquired weakness and pre-existing neurological disease. Reported presumed OD-related complications typically include aspiration-induced pneumonia, increased rates of both reintubation and tracheostomy and increased ICU readmission rates.

CONCLUSIONS: Many Swiss ICUs have established standard operating procedures, with most using sequential clinical approaches to assess ICU patients at risk of dysphagia. OD confirmation is mostly performed using non-instrumental techniques. In general, it appears that awareness of OD and ICU educational curricula can be further optimised.

Trial registration number: NCT 03487510

Key words: *dysphagia, critical illness, ICU, swallowing dysfunction, deglutition disorder, sepsis*

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Introduction

Oropharyngeal dysphagia (OD) and its associated consequences (e.g. aspiration-induced pneumonia) can often be observed in intensive care units (ICUs) [1, 2]. Until recently, the incidence of dysphagia in general ICU populations was unclear, with many studies limited by design, sample size or inclusion of heterogenous patient cohorts [3–8]. Recent data from a large-scale prospective study in a non-selected (i.e. mixed medical/surgical) ICU population demonstrate an incidence of post-extubation dysphagia (PED) on the ICU of 12.4% (18% of emergency admissions affected), with dysphagia mostly persisting until hospital discharge and an excess 90-day mortality rate of 9.2% [9]. In addition, data hint at a high economic burden of dysphagia on both the ICU sector and public health care systems [9, 10].

Importantly, there is currently a lack of standardised protocols to assess OD. Different approaches to dysphagia assessment in the ICU, e.g. both screening for OD risk and following this with confirmatory testing, have been proposed. Confirmatory tests differ regarding whether they are performed using non-instrumental, i.e. clinical, approaches by dysphagia specialists ([11–29]; reviewed in [30]), or using instrumental measures [31–44], e.g. flexible endoscopic evaluation of swallowing (FEES) or video-fluoroscopic swallowing study (VFSS) [2]. Importantly, awareness of OD in the ICU regarding screening for, diagnosing or managing it may be limited, and an accepted standard of care for OD assessment in ICU patients is currently lacking [45, 46]. In light of the fact that dysphagia is a commonly observed clinical problem on the ICU and the lack of an internationally accepted clinical standard, the present survey (DICE) aims to explore the current clinical standard of care for OD management in Switzerland. This includes dysphagia recognition, screening, diagnosis and treatment in Swiss ICUs.

Material and methods

A 23-item internet-based questionnaire (see appendix 1) was used to systematically record the current screening, diagnosis and treatment approaches for OD on Swiss ICUs (DICE). This questionnaire was developed based on our

own institutional experience, established internal standard operating procedures, and data presented in the DYnAMICS study [9] and other recent publications on dysphagia [2, 30]. All 49 Swiss ICUs accredited by the Swiss Institute for Continuous Education for ICU training in adults were contacted and asked about their local clinical practice standards. Units are categorised as Au, A, B and C according to their accreditation levels (Au being tertiary care academic teaching hospitals). Further details are listed elsewhere (www.siwf-register.ch). DICE was performed from 11/2017 until 03/2018. Chief physicians and/or senior ICU specialists were invited to participate and complete the questionnaire. The 49 accredited Swiss ICUs include seven tertiary academic centres (Au). These provide care for mixed medical/surgical populations (n = 3), strictly surgical (n = 2) or strictly medical (n = 2) patient cohorts. The remaining 42 institutions are categorised as A-level (n = 10), B-level (n = 11) or C-level institutions (n = 21). They provide intensive care for mostly mixed patient populations. No specific hypothesis was used. The intension was to investigate the current (national) standard of ICU care. Ethics approval for DICE-Swiss was waived by the Ethics Committee on Human Research (Kantonale Ethik-Kommission, KEK, Bern, Switzerland).

Statistical analysis

Descriptive analyses were used to compare results reported as counts or percentages. For categorical data, Fishers' exact test was used to compare nominal data between groups with small sample sizes. Significance was assigned to cases where a two-sided p-value was <0.05. Statistical analysis was performed using MedCalc 16.4.3 Software (MedCalc, Mariakerke, Belgium) and SPSS (IBM SPSS Statistics, Version 25).

Results

Centre characteristics and response rates

Thirty-seven registered Swiss ICUs participated in this nationwide investigation (total response rate of 75.5%). All (n = 7, 100%) accredited tertiary care academic university hospitals (Au-units) participated in the survey. Duplicate reports were returned by two institutions, resulting in only the first report being analysed, as pre-defined. Data were available from n = 9/10 (90%) of the A-units, n = 10/11 (91%) of the B-units, and n = 11/21 (52%) of the C-units (table 1). Most ICUs were interdisciplinary (medical/surgical, n = 26/37, 70.3%), followed by mixed medical or mixed surgical units (both n = 4/37, 10.8%). Two neurological units and one cardiovascular unit were included (table 1). The total number of ICU beds per unit ranged from ≤6 beds (n = 1) to 7–12 beds (n = 21/37, 56.8%), and ≥30 beds (n = 3). The number of patients treated per year ranged from <750 patients (n = 4/37, 10.8%), 751–1500 patients (n = 20/37, 54.1%), 1501–2250 patients (n = 6/37, 16.2%), 2251–3,000 patients (n = 5/37, 13.5%) to 3001–3750 patients (n = 2/37, 5.4%).

Screening approaches

All participating units considered swallowing disorders a significant clinical problem in the ICU. Approximately 68% of institutions have a standard operating procedure (SOP) for OD (n = 25/37). Three units planned to implement an SOP in the near future, whereas nine units (n = 9/37, 24.3%) had not installed an SOP and had no plan to install one in the near future (see appendix 2). Twenty-seven percent (n = 10/37) of institutions systematically screen all ICU patients, whereas in the majority (73%, n = 27/37) of units, dysphagia-related risk is assessed on an individual basis (table 2). Five units assess all potentially affected ICU patients (table 2).

Frequency analysis showed that in 17 out of 37 units (46%, multiple answers analysis, data not shown), OD risk was assessed in four groups of patients, i.e. in ICU patients post extubation/decannulation, in patients with known baseline neurological disease, in cases of pre-existing swallowing disorders, and in patients with clinical signs suggesting a deglutition disorder. When analysing these categories separately, ICU patients post extubation and patients with clinical signs indicating dysphagia are screened with the high-

Table 1: Centre characteristics.

		Training level			
		Au (n = 7/7)*	A (n = 9/10)	B (n = 10/11)	C (n = 11/21)
		n (%)	n (%)	n (%)	n (%)
Type of ICU	Interdisciplinary (mixed medical/surgical)	3 (42.9)	6 (66.7)	9 (90)	8 (72.7)
	Mixed medical	2 (28.6)	1 (11.1)		1 (9.1)
	Mixed surgical	2 (28.6)	2 (22.2)		
	Neurological			1 (10)	1 (9.1)
	Cardiovascular				1 (9.1)
Beds per ICU	1–6				1 (9.1)
	7–12	1 (14.3)	2 (22.2)	8 (80)	10 (90.9)
	13–18	1 (14.3)	4 (44.4)	1 (10)	
	19–24	2 (28.6)	3 (33.3)	1 (10)	
	>30	3 (42.9)			
Patients per year	<750			1 (10)	3 (27.3)
	751–1500	2 (28.6)	4 (44.4)	7 (70)	7 (63.6)
	1501–2250	1 (14.3)	3 (33.3)	2 (20)	
	2251–3000	3 (42.9)	1 (11.1)		1 (9.1)
	3001–3750	1 (14.3)	1 (11.1)		

* 49 accredited ICU training units were contacted initially (response rate 76%).

est frequency (67.6%). This is followed by patients with neurological deficits and patients with pre-existing swallowing dysfunctions (62.2%).

Technical aspects regarding screening measures

The initial screening is performed by trained ICU nurses in the majority (65%) of institutions, followed by other nurses (n = 10/37, 27%), speech language therapists (SLT, 27%), physiotherapists (PT, 32%) and occupational therapists (OT, 13.5%). In three units, screening is performed by physicians (ICU physician in n = 2/37, 5.4%; ear-nose-throat (ENT) physician n = 1/37, 2.7%). Initial screening is mostly performed non-instrumentally using a bedside swallowing evaluation (BSE, n = 13/37, 35.1%) or a water swallow test (WST, n = 19/37, 51.4%). One unit reported performing an instrumental approach (FEES) (n = 1/37, 2.7%). (See table 2.)

Incidence of OD in Swiss units

Estimated dysphagia frequency rates in ICUs ranged from 0–10% (n = 4/37, 11%) to 71–80% (2/37, 5.4%), with the majority of units reporting an incidence between 11 and 20% or 21 and 30% (both n = 11/37, 30%).

Confirmatory testing for OD

Overall, 86.5% (32/37) of all units had established a sequential approach for dysphagia testing, i.e. a screening procedure for OD risk assessment followed by a confirmatory test evaluating OD presence. In 91.9% (34/37), OD diagnosis is established by a dysphagia specialist (either SLT, PT or OT). In a minority of units (n = 2) this would only be performed by a physician. One unit reported no confirmatory assessment measures. Most units have appointed multiple team members to participate in OD confirmation. In detail, testing by SLTs was reported to occur in 54.1% (n = 20/37), by PTs in 24.3% (n = 9/37), and by OTs in 18.9% (n = 7/37) of institutions. OD confirmation is performed by ICU physicians in 5.4% (n = 2/37) and by ENT physicians in 43.2% (n = 16/37) of institutions. BSE is the bedside clinical exam most commonly used to establish a diagnosis (n = 23/37, 62.2%), followed by FEES (24.3%, n = 9/37), which is performed mostly by ENT physicians (n = 6/9, 66.7%). Diagnosis is established by ICU physicians who do not have formal FEES accreditation in 2.7% (n = 1/37) of institutions, and other approaches are used in 5.4% (n = 2/37) of institutions. (See table 2.)

Table 2: Responses regarding the screening, confirmation and treatment of dysphagia in all participating ICUs, as well as the methods used for assessing OD.

ICU responses		All (n = 37)		Au+A ICUs (n = 16)		B+C ICUs (n = 21)		p-Value
		n	%	n	%	n	%	
Screening of which patients?	All	5	13.5	2	12.5	3	14.3	1.00
	Post extubation	25	67.6	12	75	13	61.9	0.49
	With baseline neurodeficits	23	62.2	7	43.8	16	76.2	0.09
	Pre-existing dysphagia	23	62.2	8	50	15	71.4	0.31
	Clinical signs	25	67.6	10	62.5	15	71.4	0.73
Screening performed by?	ICU nurse	24	64.9	11	68.8	13	61.9	0.74
	Any nurse	10	27.0	4	25	6	28.6	1.00
	SLT	10	27.0	4	25	6	28.6	1.00
	PT	12	32.4	4	25	8	38.1	0.49
	OT	5	13.5	2	12.5	3	14.3	1.00
	ICU physician	2	5.4			2	9.5	0.50
	ENT physician	1	2.7			1	4.8	1.00
How do you screen?	FEES	1	2.7			1	4.8	1.00
	BSE	13	35.1	5	31.3	8	38.1	0.74
	WST	19	51.4	10	62.5	9	42.9	0.33
	Test meal	1	2.7			1	4.8	1.00
	Other	3	8.1	1	6.25	2	9.5	1.00
Confirmation of OD by?	No confirmatory examination	1	2.7			1	4.8	1.00
	SLT	20	54.1	9	56.3	11	52.4	1.00
	PT	9	24.3	6	37.5	3	14.3	0.14
	OT	7	18.9	2	12.5	5	23.8	0.67
	ICU physician	2	5.4			2	9.5	0.50
	ENT physician	16	43.2	8	50	8	38.1	0.52
	Any nurse	1	2.7	1	6.25			0.43
Method for confirmation?	Clinical evidence	4	10.8			4	19.0	0.12
	BSE	23	62.2	10	62.5	13	61.9	1.00
	FEES	9	24.3	5	31.3	4	19.0	0.46
	other	1	2.7	1	6.25			0.43
Treatment for OD?	NPO	9	24.3	6	37.5	3	14.3	0.14
	Dietary modification	29	78.4	12	75	17	81.0	0.71
	Tube feeding	18	48.6	7	43.8	11	52.4	0.74
	Tracheostomy	8	21.6	6	37.5	2	9.5	0.06
	Training	34	91.9	13	81.3	21	100.0	0.07

BSE = bedside swallowing evaluation; ENT = ear-nose-throat; FEES = flexible endoscopic evaluation of swallowing; ICU = intensive care unit; NPO = nil per os; OD = oropharyngeal dysphagia; OT = occupational therapist; PT = physiotherapist; SLT = speech and language therapist; WST = water swallow test; Fisher's exact test was used for between-group comparison (A level vs B/C level teaching hospitals).

Therapeutic approaches to OD

The reported treatment approaches for OD highlighted two main pillars of dysphagia management: dietary texture modification (78.4%, 29/37) and swallowing training by dysphagia specialists alongside functional therapy including postural changes (91.9%, 34/37). Temporary nil per os (NPO) was implemented in about a quarter of all participating units (24.3%, 9/37), with tube feeding required in 48.6% (n = 18/37) and tracheostomy required in 21.6% (n = 8/37). The responses received suggest that electrical or magnetic stimulatory techniques or any other artificial devices are not used in any of the participating ICUs. (See table 2.)

Risk factors for OD development and complications

The following suspected risk factors for OD were reported: admission for neurological disease (94.6%, n = 35/37), long-term (>5 days) mechanical ventilation/intubation (86.5%, n = 32/37), presence of ICU-acquired weakness (83.8%, n = 31/37), pre-existing neurological disease (83.8%, n = 31/37), advanced age (59.5%, n = 22/37), post-trauma conditions (59.5%, n = 22/37), use of sedatives (51.4%, n = 19/37), patients with initial sepsis (40.5%, n = 15/37), feeding tube in situ (40.5%, n = 15/37), previous intubation (37.8%, n = 14/37), use of neurotropic medications (37.8%, n = 14/37), use of muscle relaxants (35.1%, n = 13/37), high cumulative amount of opioids (32.4%, n = 12/37), emergency admission (10.8%, n = 4/37) and presence of metabolic disorders (10.8%, n = 4/37) (table 3).

A significant impact of OD on mid- or long-term mortality was assumed in nearly all participating ICUs (n = 33/37, 89.2%). Dysphagia was considered a factor which prolongs ICU stay (81.1%, n = 30/37) and increases total in-hospital treatment costs (97.3%, n = 36/37). Complications observed in the ICU include aspiration-induced pneumonia (97.3%, n = 36/37), increased reintubation (70.3%, n = 26/37) and readmission (59.5%, n = 22/37) rates, need for tracheostomy (59.5%, n = 22/37), decannulation failure (51.4%, n = 19/37) and malnutrition (40.5%, n = 15/37). 51.4% (n = 19/37) of units stated that awareness of OD on the ICU should be improved. (See table 3.)

Discussion

Previous data demonstrate that OD presents in many ICU patients, is associated with increased morbidity, and negatively impacts on mid-term survival. OD was an independent predictor of mortality in the DYnAMICS study,

Table 3: Responses regarding the presumed risk factors, complications, suspected impact on mortality, prolongation of ICU LOS, in-hospital costs and awareness of dysphagia in participating ICUs.

ICU responses		All (n = 37)		Au+A ICUs (n = 16)		B+C ICUs (n = 21)		p-Value
		n	%	n	%	n	%	
Presumed risk factors?	Age	22	59	9	56.3	13	61.9	0.75
	Emergency admission	4	11	2	12.5	2	9.52	1.00
	Metabolic disorder	4	11	1	6.25	3	14.3	0.62
	Neurological disease	35	95	16	100	19	90.5	0.50
	Trauma	22	59	10	62.5	12	57.1	1.00
	Sepsis	15	41	6	37.5	9	42.9	1.00
	ICU AW	31	84	16	100	15	71.4	0.03
	Pre-existing neurodeficits	31	84	14	87.5	17	81	0.68
	Intubation	14	38	7	43.8	7	33.3	0.73
	Long-term intubation	32	86	12	75	20	95.2	0.14
	Feeding tube	15	41	6	37.5	9	42.9	1.00
	Sedatives	19	51	8	50	11	52.4	1.00
	Muscle relaxants	13	35	5	31.3	8	38.1	0.74
	Opioids	12	32	6	37.5	6	28.6	0.73
	Neurotropic medication	14	38	6	37.5	8	38.1	1.00
Presumed complications?	Pneumonia	36	97	15	93.8	21	100	0.43
	Sepsis	13	35	5	31.3	8	38.1	0.74
	Readmission	22	59	10	62.5	12	57.1	1.00
	Re-intubation	26	70	11	68.8	15	71.4	1.00
	Tracheostomy	22	59	12	75	10	47.6	0.18
	Decannulation failure	19	51	6	37.5	13	61.9	0.19
	Malnutrition	15	41	5	31.3	10	47.6	0.50
OD impact on mortality?	Yes	33	89	14	87.5	19	90.5	1.00
	No	4	11	2	12.5	2	9.52	
OD prolongs ICU LOS?	Yes	30	81	13	81.3	17	81	1.00
	No	6	16	3	18.8	3	14.3	
	Undecided	1	2.7		0	1	4.76	
OD increases costs?	Yes	36	97	16	100	20	95.2	1.00
	No	1	2.7		0	1	4.76	
Improve OD awareness?	Yes	19	51	9	56.3	10	47.6	0.89
	No	15	41	6	37.5	9	42.9	
	Undecided	3	8.1	1	6.25	2	9.52	

ICU = intensive care unit; LOS = length of stay; OD = oropharyngeal dysphagia Fisher's exact test was used for between-group comparison (A level vs B/C level teaching hospitals).

showing an excess 90-day mortality of +9.2% [9]. With increasing awareness of the associated socio-economic consequences, we investigated the current clinical practice standards in Swiss ICUs. In DICE, we observed that most ICUs have established internal standard operating procedures for OD, and that initial screening is performed at the bedside by nurses, followed by OD confirmation using non-instrumental methods (a sequential approach).

In this survey, estimates of OD incidence rates varied widely. Different responses are expected based on personal experience, and the rather wide range of variation may theoretically be related to differences between the institutions (e.g. increased OD rates in neuro-ICU units). Nevertheless, there was also a wide range of estimated OD incidence rates for units treating mixed populations of critically ill patients. It seems tempting to speculate that this may be related to the fact that most units have not installed a systematic assessment of all potentially affected ICU patients. In DICE, we found that in 24.3% of the participating institutions there is currently no SOP for OD management in place, and a minority (13.5%) screen all potentially affected ICU patients.

Presumed key consequences of OD included aspiration-induced pneumonia (97.3%). In this context, it may be important to note that mounting evidence (e.g. in stroke patients) shows that early identification of OD may reduce rates of pneumonia [47]. This evidence may support the screening of potentially affected ICU patients. Furthermore, evidence also shows an association between a failure to screen for dysphagia and subsequent adverse patient outcomes, with increased disability, a higher rate of discharge to a long-term care facility, and adverse outcomes up to 365 days post initial hospitalisation [48]. Although aspiration-induced pneumonia is well-known in everyday ICU practice, it should be noted that proving a cause-effect relationship between dysphagia screening and improved patient outcomes may be difficult to demonstrate [49, 50].

The MAD^{ICU} study [45], a web-based survey of members of the European Society of Intensive Care Medicine (ESICM) and the German Society of Neuro-intensive and Emergency Medicine (DGNI), reported a high overall awareness of dysphagia on the ICU even among non-neurointensivists. About 80% perceived dysphagia as a relevant issue. This surprisingly high (according to the authors) percentage may be due to a selection bias, with more physicians who have a special interest in dysphagia participating in the survey. One key finding of the MAD^{ICU} study is the lack of a standardised diagnostic and instrumental approach to screening and diagnosing dysphagia outside of a neurointensive care setting, with only 27.7% of ICU respondents having specific dysphagia-related protocols in use. Based on our survey, all participating Swiss ICUs considered dysphagia a problem in the ICU, with nearly 68% (25/37) already having a standard operating procedure in use. This is an even higher proportion than in the neuro-intensive care units which participated in the MAD^{ICU} survey (n = 41/69, 60.3%). FEES seemed to be more widely available for evaluating dysphagia among the units which participated in the MAD^{ICU} study, with an overall availability of 51.1% (n = 268/528), and used more frequently in both the neuro-intensive care setting (n = 59/69, 85.5%) and in the general ICU environment (n = 209/459, 45.8%) than in Switzerland (n = 9/37, 24.3%).

Another study, a nationwide survey of Dutch Intensive Care Units [46], found a high overall awareness of dysphagia (Likert score ≥4 from 84% of respondents), but found that only a few ICUs (n = 15/67, 22%) had established standard operating procedures for dysphagia. Furthermore, in this Dutch investigation only one unit routinely used FEES for dysphagia screening, which is in line with the findings reported here. However, whereas about 60% (40/67) of ICUs occasionally use FEES in The Netherlands, this is only rarely implemented on Swiss ICUs.

Over 88,000 ICU patients were admitted to Swiss ICUs in 2017, with 34% in need of invasive mechanical ventilation (Swiss Society of Intensive Care Medicine [51]). Given an incidence of post-extubation dysphagia of 12.4% [9] according to the largest prospective investigation using a systematic screening approach, approximately 3,700 patients may have been affected by OD in Switzerland in 2017. Thus, about 340 dysphagia-related deaths (9.2% excess 90-day mortality rate) may have occurred in Switzerland in 2017. This underlines the importance of OD on the ICU.

We are aware of limitations of this survey, including the fact that the presented results could theoretically reflect the opinions of the senior ICU physicians who participated, and not objectively present patient data (e.g. regarding OD incidence). In contrast to the MAD^{ICU} survey, in which it is most likely that ICU physicians with a special interest in dysphagia participated, we deliberately aimed to exclude this potential selection bias. However, although we cannot rule out a certain bias, a near complete data set of all the major teaching hospitals is presented in the current investigation. Furthermore, by nature of the deliberately chosen approach, a survey can only present the standards of care current at the time the investigation is performed.

Conclusions

Most Swiss ICUs have established standard operating procedures for the assessment of dysphagia on the ICU. Sequential approaches most often use non-instrumental assessment techniques. Most senior ICU physicians believe that awareness of dysphagia could be improved. We thus support the creation of an international expert panel to address recommendations for optimal OD screening, confirmation and management in critically ill patients on the ICU.

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Appendix 1

Questionnaire

1 Where are you from?

2 What (ICU) type would best describe your unit?

. Interdisciplinary (Mixed medical/ surgical)

. Mixed medical

. Mixed surgical

. Trauma/ Neurosurgical

. Neurological

. Cardiovascular

. ECMO unit

3 How many total ICU beds?

. 1-6 / 7-12 / 13-18 / 19-24 / 25-30 / >30

4 How many patients do you treat per year on your ICU?

. < 750 / 751-1500 / 1501-2250 / 2251-3000 / 3001-3750 / 3751-4500 / 4501-5250 / 5251-6000 / >6000

5 Do you generally consider swallowing disorders (dysphagia) a problem in your ICU patients?

. yes / no

6 Do you have a standard of care for dysphagia, i.e. standard operating procedure (SOP) installed for dysphagia?

. yes / no / planned in near future

7 Do you routinely screen your ICU patients for dysphagia?

. yes, systematic screening of all ICU patients

. yes, screening on individual basis

. no screening performed

. screening planned in near future

8 Which patients do you screen for dysphagia on a routine basis?

. all ICU patients

. all ICU patients post extubation/ decannulation

. all ICU patients with baseline neurological disease

. all ICU patients with known pre-existing swallowing disorder

. all ICU patients with clinical signs for dysphagia (e.g. aspiration)

9 Based on your screening results/ guess: how many of your patients have dysphagia during ICU stay?

. 0-10% / 11-20% / 21-30% / 31-40% / 41-50% / 51-60% / 61-70% / 71-80% / 81-90% / 91-100%

10 If performed: who is initially screening for dysphagia on your ICU?

. no screening performed

. screening by trained ICU nurse

. screening by any nurse

. screening by speech language pathologist (SLT)

. screening by physiotherapist (PT)

. screening by an occupational therapist (OT, also ergotherapist)

. screening by ICU physician

. screening by Ear-Nose-Throat (ENT) physician

. screening by any other physician

11 How do you initially screen for dysphagia on your ICU?

. test meal

. non-instrumental: water swallow test

. non-instrumental: bedside clinical exam (BSE)

. fibre-endoscopic evaluation of swallowing (FEES)

. videofluorescent swallowing study (VFSS), modified barium swallow

. manometry

11(a) Who performs FEES at your unit?

. Ear-Nose-Throat (ENT) physician

. ICU physician with FEES accreditation

. ICU physician without FEES accreditation

. other

12 Do you have a sequential approach for dysphagia testing (screening followed by a specialist assessment)?

. yes / no

13 If a sequential approach is used: who is performing the specialist exam?

. does not apply: no confirmatory testing performed

. speech-language therapist (SLT)

. physiotherapist (PT)

. occupational therapist (OT, also ergotherapist)

. ICU physician

. Ear-Nose-Throat (ENT) physician

. any other physician

. trained ICU nurse

. any other nurse

14 What technique is used to establish the diagnosis "dysphagia"?

. clinical evidence for dysphagia (e.g. aspiration)

. clinical exam: bedside swallowing examination (BSE)

. fibre-endoscopic evaluation of swallowing (FEES)

. videofluoroscopic swallowing study (VFSS)

. manometry

14(a) Who performs FEES at your unit?

. Ear-Nose-Throat (ENT) physician

. ICU physician with FEES accreditation

. ICU physician without FEES accreditation

. other

15 How do you treat your ICU patients with dysphagia?

. nil per os during ICU stay

. dietary texture modification

. tube feeding only during ICU stay (oro-/naso-gastric, percutaneous enteral)

. (early) tracheostomy

. swallowing training: functional therapy for motor/ sensomotor recovery incl. postural changes (PT/SLT)

. catheter-related electric stimulation

. transcranial magnetic/ electrical stimulation

16 In your opinion, what are major risk factors for developing dysphagia in ICU patients?

. age of ICU patient

. emergency admission to ICU

. admission to ICU for acute metabolic disorder (e.g. acidosis, electrolyte, or azotemia)

. admission to ICU for acute neurological disease

. admission to ICU for trauma incl. traumatic brain injury (TBI)

. admission to ICU for sepsis/ septic shock

. pre-existing or (ICU-) acquired muscle wasting/ cachexia

. pre-existing neurological disease

. any oro-/naso-tracheal intubation

. long-term intubation (> 5 days)

. presence of oro- or nasogastric feeding tube

. cumulative amount of sedatives used

. cumulative amount of muscle relaxants used

. cumulative amount of opioids used

. cumulative amount of neurotropic medication (e.g. anticonvulsives, anti-psychotics, anti-depressants)

17 Do you think that dysphagia diagnosed on the ICU impacts mid- or long- term mortality (mortality at >28d)?

. yes / no / undecided

18 Do you think that dysphagia diagnosed on the ICU prolongs ICU length of stay?

. yes / no / undecided

19 Do you think that dysphagia diagnosed on the ICU increases total in-hospital treatment costs?

. yes / no / undecided

20 What type of dysphagia related medical complications do you routinely encounter in your ICU patients?

. no Dysphagia-related complications

. aspiration-induced pneumonia

. sepsis (e.g. due to pneumonia or catheter-related infections)

. need for ICU re-admission

. need for re-intubation

. need for tracheostomy

. failure for decannulation

. underfeeding / cachexia

21 Should dysphagia awareness be improved in your ICU?

. yes / no / undecided

22 Do you consider ICU acquired weakness (ICU-AW) a problem in your patients?

. yes / no / undecided

23 Do you have a standard operating procedure (SOP) for patients with ICU-AW?

. yes / no / planned to develop in the near future

Appendix 2

Additional results

ICU responses.

		All (n = 37)		Au+A ICUs (n = 16)		B+C ICUs (n = 21)		p-value
		n	%	n	%	n	%	
Is dysphagia a problem?	Yes	37	100	16	100	21	100	
SOP installed?	Yes	25	67.6	12	75	13	61.9	0.87
	No	9	24.3	3	18.8	6	28.6	
	Planned	3	8.1	1	6.25	2	9.5	
Screening routinely?	Yes, all	10	27.0	6	37.5	4	19.0	0.27
	Yes, selectively	27	73.0	10	62.5	17	81.0	
Estimated OD frequency?	0–10%	4	10.8	1	6.25	3	14.3	0.62
	11–20%	11	29.7	5	31.3	6	28.6	0.84
	21–30%	11	29.7	4	25	7	33.3	0.72
	31–40%	5	13.5	3	18.8	2	9.5	0.63
	41–50%	1	2.7			1	4.8	1.00
	51–60%	3	8.1	2	12.5	1	4.8	0.57
	71–80%	2	5.4	1	6.25	1	4.8	1.00
Sequential approach?	Yes	32	86.5	13	81.3	19	90.5	0.63

ICU = intensive care unit; OD = oropharyngeal dysphagia; SOP = standard operating procedure